CA SBX7-7:
In Support of Volume-Only Accuracy Limits and Water Control to Maximize Water Use Efficiency

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SBX7-7 seeks to maximize the efficient use of water in California. Two factors are necessary to achieve this goal – accurate volume-only measurements and accurate water control capability.

The instant bill indicates that the reporting shall be in terms of **volume**. This renders considerations of competing approaches other than volume cumbersome and unnecessary.

Volume Accuracy Standards:

Volume is a static thing. **Flow** on the other hand can relate to **flow-rate** or **flow-velocity**, or both. To obtain the key measure (**volume**) flow-rate is time dependent and flow-velocity is area dependent. Meters are calibrated in a hydraulic laboratory to achieve certain flow accuracy. It is important to relate Flow and Volume as interchangeable and assume the accuracy of each parameter to be equivalent. In order to do this, one must assume that the time variable is highly accurate and does not contribute to the overall statistical error of the **Volume** or **Flow** calculation. Once velocity-limits are defined, then area limits need to be carefully defined with measurements like channel width, depth, shape and surface roughness.

For example:

- Velocity is distance per unit time.
- Area requires the integration of canal width, depth, shape and the like.

Thus volume accuracy within +/- 6 % could nearly be satisfied by an area-accuracy within +/- 10% when combined with a velocity-accuracy of +/-½ %. Of course other combinations of area and velocity accuracy can also achieve the desired +/- 6% volume accuracy. Thus, simply leaving the requirement as an accuracy-limit on volume allows many approaches to compliance without further complications.

Volume-only on-site accuracy limit is at about +/- 6% is further supported by the following:

- As a former guidance standard from USBR for measuring by volume at the farmer turnout.

- Very tolerant limits may preclude identifying low-end users and high-end users.

- A level of +/- 6% appears accurate enough to accomplish the goal of improving water use efficiency for high-end users, but much larger margins may not.

- The water-conservation advantages of this identification ability are numerous. Low-efficiency users could be offered assistance (for example from Extension and Natural Resources Conservation Service.) This would raise their production-unit efficiencies and provide economic advantages for themselves and their communities.

- High-efficiency users could serve as model operations and qualify for financial rewards through lower pricing, tax or fee waivers, water credits for other uses or the like. While the usual concern of economist and policy makers, conservation engineering and water management interests might be better served by incentives rather than penalties.

- The purpose of the meter survey was to determine Best Available Technology (BAT) for a reasonable cost. Virtually all meters listed in the document have been shown by ITRC and CIT to have an on-site inaccuracy of +/-5%. Thus there is no practical or economic policy rationale to *double* volume accuracy standard to +/- 10% - simply to accommodate a single outlier meter product.

- While **flow meter accuracy** at the farmer turnout forms the foundation of irrigation system modernization **flow control** is required to fully achieve the goals of SBX7-7. The higher the accuracy, the less likely a district will spill water because water operations managers can more accurately determine the flows that enter the distribution system.

Value of Water Control:

Meter accuracy at the farm turnout forms the foundation of irrigation system modernization envisioned by SBX7-7. For example, the higher the accuracy, the less likely a district will spill water because water operations managers can more accurately determine the flows that enter the distribution system.

However, as many Ag committee members have commented, measurement accuracy alone will not maximize water use efficiency. To meet the goals of SBX7-7 fully other variables must be considered. Crops must receive water at the right time and for the right duration. Crop water demand is more effectively met by matching shutoff times to 6-hour, 12-hour or 24-hour duration intervals. Knowledgeable users with special soils knowledge (like monitoring soil moisture sensors) may be needed. Currently water is wasted since most farmers order plenty and run tail water to assure completion.

Accuracy alone for water measurement will not necessarily improve water use efficiency as many Ag committee members have commented. It is necessary for crops to receive water at the right time and duration to realize water savings potential. Being able to specify a requested flow rate such that shutoff-times can be made to match 6-hour, 12-hour or 24-hour duration intervals will more effectively meet crop-water demand. Knowledgeable users and special soils knowledge (monitoring of soil moisture sensors) may be needed to accomplish this. As it is now, most farmers overly order and produce some tail-water runoff to assure adequate irrigation. This in its worst form produces excessive infiltration and surface runoff, which can contaminate both groundwater and stream flows with pesticides and leached fertilizer.

The farm operators conceivably will wish to have control over duration if they will be charged by volume. In cases where the district's ability to satisfy the user in controlling duration become apparent, a control gate can be incorporated with the meter. In many situations, farm operators have the authority to open and close their own gates at the turnouts. However, full automation or even the luxury of allowing variable shutoff without notice is hard to handle without special canal freeboard availability or construction of strategic storage reservoirs. Having said this, canal control by the districts, if not automated, will improve after each automated farm turnout installation, thus reducing spills and ultimately saving water.